International Journal of PharmTech Research
CODEN (USA): IJPRIF, ISSN: 0974-4304, ISSN(Online): 2455-9563
Vol.13, No.03, pp 192-197, 2020

Quality and Food Safety of Smoked Stingray Fish Products in District of Jeneponto, Province of South Sulawesi

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Abstract : Stingray fish inhabit warm tropical and subtropical coastal waters and some of which can be found in freshwater. To increase economic value, Stingray fish in Jeneponto are sold as smoked products. Smoked fish are processed fisheries products that through the process of salting and fumigation. This study aims to determine the quality and food safety of smoked stingray fish products produced in Jeneponto Regency, South Sulawesi Province. Samples of smoked stingrays were taken from processors in Jeneponto Regency used the *Purposive Sampling* method. The samples were analyzed the quality and food safety parameters in the Laboratory of the Center Implementing the Quality of Fisheries Products South Sulawesi. The results show that the quality and food safety of smoked fish products produced in Jeneponto Regency for several parameters are in accordance with SNI 2725: 2013, namely sensory (± 7.1), moisture content (± 59.59%), fat content (± 4.86%), Histamine (± 18.39mg / kg), E. coli (<3MPN / g) and Plumbum levels (± 0.0279 mg / kg). The Total Plate Count (TPC) exceeds the quality and food safety requirements of smoked fish products which are 3.2x106 kol / g.
Keywords : quality, food safety, stingray fish, smoked, Jeneponto.

Introduction

Jeneponto is one of the districts in South Sulawesi Province, which has an area of 749.79 km² consisting of 11 sub-districts, with Bangkala Barat sub-district as the broadest sub-district, which is 152.96 km2, equivalent to 20.4 percent of the area of Jeneponto Regency. While the smallest sub-district is Arungkeke which is 29.91 km2. Jeneponto Regency is located at the southern end of the capital city of South Sulawesi Province. Geographically, Jeneponto Regency is located in coordinates between 5°20" to 5°40" South Latitude and 119°50" to 120°28" East Longitude. The fishery potential of Jeneponto Regency is quite large with annual production abundant. One of the marine fisheries in Jeneponto Regency is Stingray fish.

DOI= http://dx.doi.org/10.20902/IJPTR.2019.130309

Stingray is one type of fish that is not economical. In Jeneponto Regency, Stingray fish is processed through a fumigation process to increase its economic value. Stingray processed through the fumigation process will have a very tasty and long-lasting taste because wood smoke contains compounds that can taste and inhibit bacterial growth. Because the taste of smoked stingrays is high, making this processed product very popular with the community, so smoke stingray is one of the superior products that are typical and popular in Jeneponto Regency[1].

The process of fish fumigation in Jeneponto Regency is still done traditionally. During this time traditional preservation/processing still has a bad image in the eyes of consumers, because of the low quality and nutritional value, inconsistent functional properties, and the absence of quality and safety guarantees for consumers. Traditional processors generally still pay less attention to the security issues and the quality of the products produced.

Some studies that have been conducted on fish fumigation include the use of smoking cabinets and traditional stoves to determine the quality of smoked fish from different types of fish[2], the performance of cabinet-type fish smokers and their effect on the quality of smoked fish[3], the level of safety of Manyung (*Arius thalassinus*) fumes processed by different smoke methods [4], sanitation and contamination of catfish smoke microorganisms [5], chemical qualities of Cakalang fish (*Katsuwonus pelamis* L.) asap (FUFU) during storage of room temperature and cold temperatures [6], quality characteristics of Cakalang fish (*Katsuwonus pelamis*) smoke using liquid smoke [7], quality of Cakalang fish (*Katsuwonus pelamis*) asap [8], the quality of smoked Cakalang (*Katsuwonus pelamis* L.) fish on the value of water content and PH during storage [9], improvement of organoleptic quality of Roa fish (He mirhamphus sp.) smoke through a closed chamber smoking method [10].

Nevertheless, there is still little information about the quality and food safety of smoked fish products, especially those produced in Jeneponto Regency. Based on this, the researchers conducted a study of the quality and safety of smoked fish at the processing level, especially in Jeneponto Regency.

Research Methods

This research was conducted in July - August 2018. Sampling of smoked fish was carried out using the *Purposive Sampling Method* in Jeneponto Regency. Quality and food safety parameters of smoked fish were analyzed in the Laboratory of the Center Implementing the Quality of Fisheries Products South Sulawesi. Quality and food safety parameters analyzed were sensory, water content, fat content, histamine, TPC, *Escherichia coli* and Plumbum metal contamination. The results obtained refer to SNI 2725: 2013 concerning security requirements and quality of smoked fish with heat fumigation [11].

Sensory testing used smoked fish sensory testing sheets with SNI 2346: 2011 heat fumigation, water content (SNI 2354.2: 2015), fat content (SNI 01-2354.3-2006), histamine (SNI 2354.10: 2009), ALT (SNI 01-2332.3) -2006), *Escherichia coli* contamination (SNI 01-2332.1-2006), and Plumbum metal contamination (SNI 2354.5: 2011). The research data was processed using the *SPSS 20* computer program for Windows.

Results and Discussion

a. Process of Processing Smoked Fish in Jeneponto Regency

The process of processing smoked fish in Jeneponto Regency is still traditionally carried out and still does not pay attention to sanitation and hygiene aspects. Raw materials is stingray fish obtained from the waters of Jeneponto Regency, prepared (removed from the tail and cut into pieces), washed, stabbed using bamboo that has been cut into pieces, drained and smoked (Figure 1).

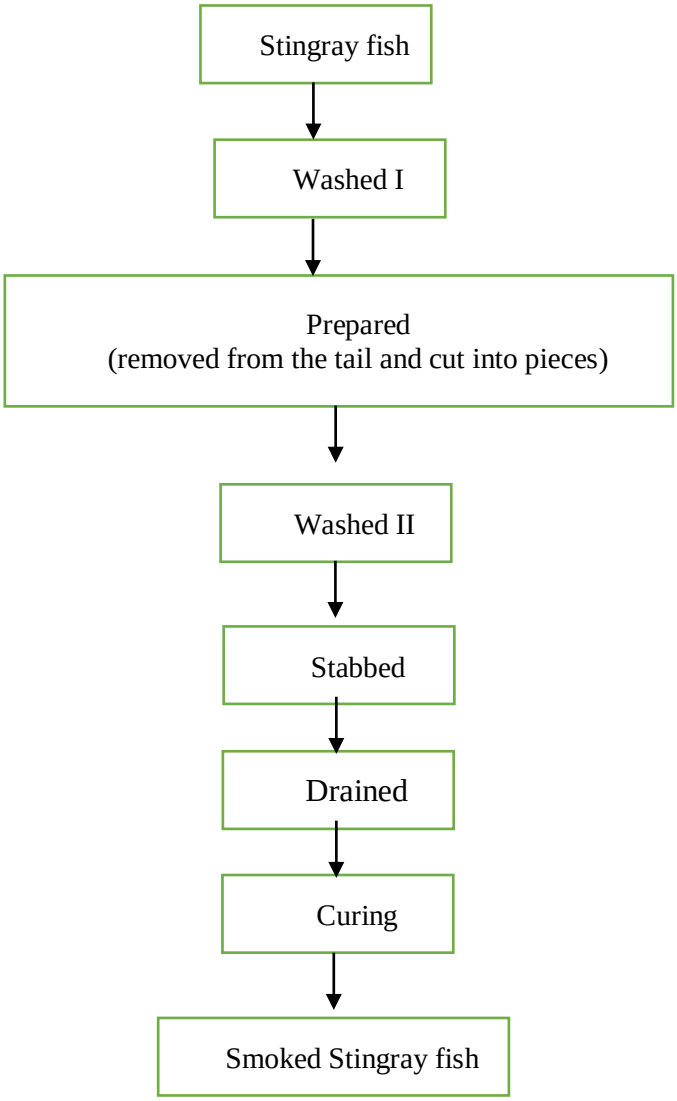

Figure 1. The Process of processing Smoked Stingray in Jeneponto Regency

In processing smoked stingray fish in Jeneponto Regency, the average processor does not add salt. Where generally in the curing process, salting is carried out before fish or smoked raw materials. The process of fumigation, it combines the process of salting, heating and adhering to the chemical components of smoke.

Water used to wash stingrays before smoked, is taken from the tap and stored in a bucket or in a basin. The fish is washed in a bucket/basin. During preparation, the raw material is also left on the floor without coating, the container used is not clean, the processor does not use gloves or equipment that can prevent contamination and there is no use of low temperatures.

The method used is hot fumigation. Where the raw material is placed above the source of smoke with a distance of less than 30 cm. [12], wrote that in the fumigation process, there are two ways that are often used, namely cold fumigation where the material is placed far from the source of smoke and fumigation where the material is placed relatively close to the source of smoke.

The equipment used is very simple, in the form of drums and iron that are made to resemble rectangles and are equipped by each supporting pole. The source of smoke used by smoked fish processors in Jeneponto Regency is corn lumps and coconut fiber. Fumigation is carried out with the aim of preserving, adding to taste and improving the color of fish by utilizing the chemical compounds present in smoke.

b. Sensory Quality

Based on SNI 2725: 2013 [11], minimum quality requirements for smoked fish with fumigation are 7, for each parameter, namely appearance, odor, taste, texture, fungus and mucus. The results of sensory ray smoke quality test produced in Jeneponto District ± 7.1. This value indicates that the sensory quality of smoked stingrays produced in the district is above the value required by SNI 2725: 2013. This value shows specifications for intact appearance, product-less shiny color, less specific smell of smoked fish, less specific taste of smoked fish strong, dense, compact texture, close enough between tissues, no mold and mucus.

Value 7.1 for sensory quality is caused by processing. In short, imitation causes high water content in the raw material. The high water content of raw materials causes the small amount of smoke particles that attach so that the compounds that determine organoleptic properties in less smoke are formed. [13] suggested that before the raw material was smoked, drying was done so that the smoked fish products produced were shiny. Apart from the fumigation process, the quality of raw materials also affects the sensory quality of smoked fish products.

c. Water Content

Water content is one of the important characteristics of food, because water can affect the appearance, texture, and taste of food. The high and low water content in food also determines the durability of the food, high water content resulting in easy bacteria, mold, and yeast to multiply, so that changes will occur in food [7].

The water content of smoked stingrays produced in Jeneponto Regency is ± 59.59%. This value is still in accordance with what is required by SNI 2725: 2013 but is nearing the maximum limit of the water content of smoked fish with heat fuming, that the maximum water content of smoked fish with a method of heat fuming is a maximum of 60%.

The results of the research by [14], showed that the average water content of smoked skipjack fish taken from several smoked fish processing units in Gorontalo District 43.51-73.65%, [7] the average moisture content of smoked skipjack 59.00%, the average water content of smoked baung from three sub-districts of West Kutai, Kutai Kartanegara 11.14-13.99%, [8] the moisture content of smoked fish originating from 5 processing centers in North Sulawesi is still in accordance with SNI.

d. Fat Content

Fat is part of the content of fish that has less value than protein. But fat is a supporting factor in producing the taste and aroma of smoked fish [2]. The results of the analysis of fat content in smoke stingrays produced in Jeneponto Regency are ± 4.86%. This value is still in accordance with what is required by SNI 2725: 2013, that the maximum fat content of smoked fish with a maximum heat-smoking method is 20%.

The results of the study of [15] show that the fat content of tuna which is smoke ranges from 2.69-2.87%, [16], the fat content of smoked skipjack fish produced in Kendari ranges from 1.75-3.40%, [17], fat content of smoked tuna of 2.50-3.20%.

e. Histamine

Histamine is a derivative compound of amino acid histidine which is widely found in fish. This amino acid is one of the ten essential amino acids needed by children and infants but not essential amino acids for adults. Histamine is not harmful if consumed in low amounts, which is 8 mg/100 gr of fish. This poisoning will usually arise due to high histamine levels found in the fish we consume. Histamine poisoning will be dangerous if someone consumes fish with histamine 50 mg/100 gr fish content. While the histamine content of 20 mg/100 gr of fish, occurs because of the handling of non-hygienic fish [7]. Histamines are found in scombroid groups such as Cakalang, Tuna and Cobk. [18] wrote that in some species of fish, especially those from the scombroidae family that have red meat, damage by the activity of bacteria and enzymes can produce poisons called scombrotoxins. These toxic compounds are histamine.

The results of the analysis of histamine levels in smoke stingrays produced in Jeneponto Regency are ± 18.39mg/kg. This value is still in accordance with what is required by SNI 2725: 2013, that the histamine level of smoked fish with a maximum heat-smoking method is 100 mg/kg. Histamine levels are influenced by the quality and process of handling raw materials that do not pay attention to hygienic sanitation.

The results of [7], showed the histamine level of smoked tuna 42.32 mg/kg, [19] smoked skipjack in Ambon traditionally processed containing histamine 7.657 - 19.751 mg / g, Sulistijowati and Mile (2014), indicating that the average of skipjack tuna histamine levels taken from several smoked fish processing units in Gorontalo Regency 59.89-89.71 mg/kg.

f. Total Plate Count

Fish fumigation aims to extend the shelf life of fish. [7] suggested that the manufacture of smoked fish products in principle suppresses the growth of decomposing bacteria thereby extending the shelf life. Results Analysis of the total plate number of bacteria in smoke stingrays produced in Jeneponto Regency is ± 3.2x106 colonies/g. This value indicates that the average number of plates of smoke stingray produced in Jeneponto Regency passes the safety requirements and quality of smoked fish with hot fumigation based on SNI 2725: 2013. The high number of total plates of smoke stingray is influenced by the handling process and quality of raw materials. Raw materials are handled without regard to sanitation and hygiene. The equipment and containers used are not kept clean.

The results of research by [14], showed that the total plate count of bacteria in smoked fish obtained from the three smoke UPIs in Gorontalo Regency ranged from 3.1x103-1.5x104 colonies/g.

g. Escherichia coli

E. coli is a water quality indicator bacteria because its presence in water indicates that the water is contaminated. E. coli produces enterotoxin which causes several cases of diarrhea. In this study, E. coli was analyzed regarding water used and sanitation and hygiene in the shrimp paste processing. E. coli is not a halophilic bacteria, so with high salinity, E. coli growth cannot be inhibited.

The results of the determination of E. coli levels in smoke stingray produced in Jeneponto Regency Jeneponto are <3 APM / g. This value is still in accordance with what is required by SNI 2725: 2013, that the content of E. coli of smoked fish with heat fuming method is <3 APM / g. Although all smoked fish samples are still in accordance with the quality and safety requirements of smoked fish based on SNI, it should be noted that based on field observations, all sanitation and hygiene problems are still lacking. Places and containers used, water and other equipment still do not pay attention to sanitation and hygiene.

h. Plumbum (Pb)

Plumbum (Pb) is one indicator of the quality and safety of smoked fish products which are processed using the hot fumigation method. In this study, Pb levels were analyzed to see some phenomena of Pb metal content in some fishery products traditionally processed. [20] stated that the most common chemical contamination is Plumbum metal contamination (Pb) originating from the catchment waters of fish that have been contaminated with heavy metals and illegal additives such as formalin.

The results of determination of Plumbum (Pb) levels in smoke stingray produced in Jeneponto Regency are ± 0.0279 mg / kg. This value is still in accordance with what is required by SNI 2725: 2013, that the content of Plumbum (Pb) of smoked fish with the method of heat fuming is a maximum of 0.3 mg / kg. [20] stated that Plumbum (Pb) levels in smoked fish in the Dente Teladas District of Tulang Bawang Regency were less than 0.3 mg / kg.

Conclusion

Quality and Food safety of smoked fish products produced in Jeneponto Regency for several parameters according to SNI 2725: 2013, namely sensory (± 7.1), moisture content (± 59.59%), fat content (± 4.86%), Histamine (± 18.39mg / kg), E. coli (<3MPN / g) and Plumbum levels (± 0.0279 mg / kg). The Total Plate Count (TPC) exceeds the quality and food safety requirements of smoked fish products which are 3.2x106 kol / g.

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